A Highly Collimated Molecular Hydrogen Jet in IRAS 05487+0255.

NIR Imaging and Spectroscopy

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New narrow band near infrared images at the H_2 1-0 S(1) 2.121 μm and continuum bands, together with K band spectra of a highly collimated bipolar jet close to the IRAS 05487+0255 source are presented. The jet is located at $\sim$ 30" West of the Herbig-Haro 110 outflow. The jet and counter jet are not visible at optical wavelengths, and therefore, do not fall into the 'standard' Herbig-Haro objects classification scheme. Nevertheless, it belongs to an ever growing group of molecular hydrogen jets associated with YSOs which are optically undetected. The jet looks very well collimated, with a length-to-width ratio $\sim$ 10 - 20, and to understand this morphology and emission may require to invoke a process like entrainment in a turbulent mixing layer.

The spectra of the jet and counter-jet in the K-band show a few strong H_2 lines, despite their limited signal-to noise and the low surface brightness of the jet. Based on the 4 strongest lines excitation temperatures of 1604 $\pm$ 805 K and 2314 $\pm$ 365 K, for the red and blue-shifted jet components respectively, were obtained. The estimated reddening in the blue-shifted jet using the (1,0) Q(2) to (1,0) S(0) line ratio, gives a visual extinction $A_V \sim 14^m$. The lines in the red-shifted component are too faint for a reliable determination of its reddening. The radial velocities of the jet and counterjet, based on the shift of the (1,0) S(1) 2.121μm line, are $\sim$180 km s^{-1} and $\sim$ - 275 km s^{-1} respectively, suggesting a relatively large angle ($\sim$ 30° - 45°) between the jet and the line of sight. The H_2 emission of the entire jet extends for at least 32" or $\sim$ 0.1pc at the distance of Orion. If the flow velocity is comparable to that of the radial velocities, then the dynamical age of the system is quite short ($\sim$ 500 yrs), consistent with a young jet arising from an embedded source, as is the case e.g. for HH211.